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Factors associated with parental ratings of condition severity for children with Autism Spectrum Disorder

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Abstract

Background—There is currently little consensus on how the severity of a child's autism spectrum disorder (ASD) should be measured, and yet despite the lack of a standardized definition, parents were readily able to answer a question asking them to describe the severity of his/her child's ASD in a national survey.

Objective—The current study examined factors associated with a parent's judgment of ASD severity, by identifying child and household characteristics that were associated with a parent's severity rating of his/her child's ASD, including child ASD symptomatology, child impact, and family impact.

Methods—Data came from the 2011 Survey of Pathways to Diagnosis and Services ("Pathways"). A total of 967 parents in households with a child diagnosed with ASD between the ages of 6–17 were eligible for the current study. A measurement model was used to create latent factors of child symptoms, child impact, and family impact; multivariate logistic regression models examined the relationship between these latent factors and the parent's severity rating of their child's ASD.

Results—Children with higher family impact factor scores were more likely to have parents who rated their child's ASD as the most severe. Surprisingly, symptomatology and impact on the child were less predictive of severe ratings.

Conclusions—A parent's conceptualization of their child's ASD severity may vary more as a function of the impact of the child's condition on the family and less as a function of the symptoms exhibited by the child or the impact directly felt by the child.

Keywords

Autism spectrum disorders; parents; severity; national survey; developmental disability

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Introduction

Autism spectrum disorder (ASD) is a neurodevelopmental disability that affects approximately 1 in 50 school-aged children (6–17 years old) in the United States according to a recent national survey.[1] Children diagnosed with ASD are characterized by their social and communication deficits along with stereotyped and repetitive behaviors.[2] Co-occurring psychiatric conditions as well as intellectual disabilities are common in children diagnosed with ASD, with a substantial percentage of children also being diagnosed with attention deficit/hyperactivity disorder.[3–5]

Children diagnosed with what is considered severe ASD are more likely to have received an earlier diagnosis than those less impaired,[6–7] but definitions of severity fluctuate between studies, with little consensus on how severity should be measured.[8] To date, some definitions of severity have included the number and intensity of core symptoms, the overall level of functional impairment displayed by the child, and the child's ASD diagnosis subtype (e.g., Asperger's Disorder, Autistic Disorder). Additional definitions have focused on the presence of secondary diagnoses, including intellectual disabilities, behavioral problems, and learning disabilities. The notable variety in the definitions of severity is evidenced by the substantial number of rating scales that are currently available,[9–12] with researchers defining higher scores as greater severity.[13–16] Although these scales have considerable overlap in content, they can vary by their intended rater (teacher, clinician, or parent) and may be administered in multiple locations, thereby providing multiple contexts. As a result, severity as a construct has the potential to be conceptualized differentially by different types of raters with varying interpretations of the same symptoms.

There is the additional possibility that a reporter's assessment of a child's ASD severity may be influenced by subjective experiences. Previous research utilizing data from the National Survey of Children's Health has found that a parent's rating of the severity of his/her child's ASD is associated with various family characteristics. Children whose parents reported poor mental health, high stress levels, and greater burdens requiring higher levels of personal sacrifice were more likely to be described as having moderate to severe ASD.[17–19] In addition, children who were not receiving family-centered care or effective care coordination were more likely to be described as having moderate to severe ASD than mild ASD[20]. Severity, however, was not found to be a significant correlate of educational services, with children with severe ASD being no more likely to have an Individualized Education Program (IEP) than children with mild ASD.[21]

A recent National Center for Health Statistics (NCHS) National Health Statistics Report examined parent-reported data from the 2011–2012 National Survey of Children's Health (NSCH), which included a question about whether the parent would "describe their child's autism or ASD as mild, moderate, or severe." Blumberg and colleagues[1] found that school-aged children who were diagnosed with an ASD in or after 2008 were more likely to be described as having a milder ASD (and less likely to have a severe ASD) when compared to children diagnosed with an ASD in or before 2007. This result led to the conclusion that much of the recent observed increase in prevalence of ASD was due to improved awareness and ascertainment of ASD by doctors and other health care professionals when the

symptoms are mild.[1] The conclusion rested on the assumption that parents are reliable reporters of ASD severity, yet it is largely unknown how parents of children with ASD conceptualize the severity of his/her child's condition, especially when asked a simple survey question with limited response options.

The current study represents a population-based effort to explore a parent's conceptualization of his/her child's ASD severity by investigating related factors of child symptoms, child impact, and family impact on a parent's rating of ASD severity. It is hypothesized that all factors will independently be associated with severity ratings. Family impact is expected to have a stronger association than other factors in a combined model because stressors that directly impact the rater are likely to be more readily recalled and accessible when forming judgments.[22]

Methods

Sample

Data are drawn from two national surveys conducted by the National Center for Health Statistics (NCHS): the 2009–2010 National Survey of Children with Special Health Care Needs (NS-CSHCN) and the 2011 Survey of Pathways to Diagnosis and Services ("Pathways"). Both surveys were modules of NCHS' State and Local Area Integrated Telephone Survey (SLAITS). The 2009–2010 NS-CSHCN was sponsored by the Maternal and Child Health Bureau of the U.S. Department of Health and Human Services' Health Resources and Services Administration, and the Pathways survey was sponsored by the National Institutes of Health's National Institute of Mental Health. All consent and data collection procedures for the 2009–2010 NS-CSHCN and Pathways were previously approved by the NCHS Research Ethics Review Board, with participants giving informed consent prior to inclusion in the study. More information about Pathways and 2009–2010 NS-CSHCN may be found at: http://www.cdc.gov/nchs/slaits/spds.htm or by referring to the associated documentation published by the SLAITS program.[23–24]

The 2009–2010 NS-CSHCN was a cross sectional telephone survey that interviewed 40,242 households with children with special health care needs (CSHCN) throughout the 50 states and the District of Columbia. Households eligible for the 2009–2010 NS-CSHCN had one or more CSHCN up to 17 years of age. CSHCN include children who have one or more chronic physical, developmental, or emotional conditions which require health and related services of a type or amount beyond that generally required by children.[25] Only one child with special needs was sampled from each eligible household; if more than one child was eligible, one was randomly selected to be the subject of the 2009–2010 NS-CSHCN interview.

Pathways was a follow-back survey to the 2009–2010 NS-CSHCN for CSHCN aged 6 to 17 years who had ever been diagnosed with a developmental delay, autism spectrum disorder, or intellectual disability (n=4,032). Initial follow-back interviews were conducted via telephone with the same parent or guardian who responded to the 2009–2010 NS-CSHCN. Then, an additional supplemental questionnaire was either mailed to the household or administered over the telephone. The 2009–2010 NS-CSHCN had a 26% response rate,

while Pathways had a 62% completion rate for the general survey and a 44% completion rate for the supplemental questionnaire.

The current study analyzed 2009–2010 NS-CSHCN and Pathways data for CSHCN who had a current ASD diagnosis at the time of the Pathway survey and who had a completed and returned the supplemental questionnaire (n=967) (see Figure 1 for sampling plan). Given that children diagnosed with ASD are almost exclusively identified as CSHCN as a result of their need for routine health and related services,[26] and 95% of children with a current ASD diagnosis were identified as having a special health care need in the 2011–2012 National Survey of Children's Health,[27] hereafter we will simply identify them as children with ASD rather than CSHCN with ASD.

Measures

Children's Social Behavioral Questionnaire (CSBQ)—The CSBQ is a 49 item instrument that was developed to determine the presence and severity of social or behavior problems within the autism spectrum.[28] Parents were asked how frequently during the past month his/her child had engaged in specific behaviors, with the possible responses of "does not apply or occur," "somewhat or sometimes applies," or "clearly or often applies." The questionnaire has high internal consistency, inter-rater reliability, and test-retest reliability.[29] A comparison of the CSBQ to the Autism Diagnostic Observation Schedule (ADOS) and the Autism Diagnostic Interview-Revised (ADI-R), found the CSBQ to have high agreement with the diagnostic instruments, suggesting that the scale is capturing diagnostically relevant autism symptomatology.[30] The CSBQ is divided into six subscales that include: 1) not optimally tuned to the social situation ("tuned"), 2) reduced contact and social interest ("interest"), 3) orientation problems in time, place or activity ("orientation"), 4) difficulties in understanding social information ("understanding"), 5) stereotyped behavior ("stereotyped"), and 6) fear of and resistance to changes ("change"). A total factor score was calculated utilizing the six subscale scores, with higher factor scores indicating a greater frequency of social or behavioral problems.

Family Impact—The 2009–2010 NS-CSHCN contained a series of questions about the impact of the child's condition on the family unit. These included: 1) "have [your child's] health conditions caused financial problems for your family?" 2) "have you or other family members stopped working because of [your child]'s health conditions?" 3) "have you or other family members cut down on the hours you work because of [your child]'s health conditions?" The latter two questions were combined and subsequently dichotomized into whether a parent reported either cutting down hours or stopping work altogether (compared to neither outcome). Parents were also asked how many hours per week they spent coordinating medical services for his/her child and how many hours per week they provided medical care for his/her child. Both outcomes were dichotomized into eight hours or more per week (to indicate a parent needing to spend on average more than an hour a day) versus seven hours or less per week.

Child Impact—Four questions were utilized from the impact supplement of the Strengths and Difficulties Questionnaire (SDQ)[31] that measured how the child's behavioral and social

difficulties interfered with his or her everyday 1) “home life,” 2) “friendships,” 3) “classroom learning,” and 4) “leisure activities.” Parents could choose from the impairment options of “not at all,” “only a little,” “quite a lot,” or “a great deal.”

Autism Spectrum Disorder and Severity—In the 2009–2010 NS-CSHCN parents were first asked, “has a doctor or other health care provider ever told you that [your child] has autism, Asperger’s Disorder, pervasive developmental disorder, or other autism spectrum disorder?” If the parents confirmed a past diagnosis, they were asked the follow-up question, “does [your child] currently have autism or an autism spectrum disorder?” As part of the 2009–2010 NS-CSHCN, parents were additionally asked, “would you describe [your child’s] autism or ASD as mild, moderate or severe?” This parent report of severity serves as the outcome of interest for the current study. The Pathways survey confirmed the current diagnosis in the 2009–2010 NS-CSHCN with the question, “to the best of your knowledge, does [your child] currently have autism or ASD?”

Demographics—Parents answered questions pertaining to his/her child’s race, ethnicity, age, and sex. Parents were also asked whether his/her child had a current diagnosis of “depression,” “anxiety,” “Attention Deficit Disorder or Attention Deficit Hyperactivity Disorder,” “behavioral or conduct problems,” or “an intellectual disability or mental retardation.” Additional information was obtained at the household level, including poverty level, educational levels of household members, family structure, and number of children in household.

Statistical Analysis

All estimates were calculated using statistical software that accounted for the complex sample design of the survey. A measurement model was created utilizing Mplus software,[32] generating three latent variable factors of symptoms (formed from the six CSBQ subscales), child impact (formed from the four SDQ items), and family impact (formed from four family impact items) which were allowed to correlate with each other. Figure 2 illustrates this model including indicators of the three latent variable factors of child symptoms, child impact, and family impact. A series of fit indices were utilized to determine the model fit of the measurement model, including comparative fit index (CFI), Tucker-Lewis index (TLI), and root mean square error of approximation (RMSEA). Values 0.90 or higher are considered good fit for both CFI and TLI, while values under 0.08 are considered good fit for RMSEA.[33]

Additional analyses were completed in Stata 12.0.[34] Associations between demographic characteristics and parent-reported ASD severity were calculated utilizing corrected χ^2 tests that accounted for the survey design (presented as F-values) (see Table 1). Three separate multivariate linear regressions examined characteristics associated with the three latent variables of symptoms, child impact, and family impact (producing estimated slopes ($\hat{\beta}$)) (see Table 2). A series of multinomial logistic regressions (producing relative risk ratios (RRRs)) that were adjusted for child and family demographics compared different severity groups (with moderate ASD serving as the reference group for all analyses in order to provide a comparison to both the highest and lowest severity options), including 1)

symptoms only, 2) child impact only, 3) family impact only, 4) symptoms, child impact, and family impact ("the combined model") (see Table 3). [Other covariates were included in the models to avoid confounding the effects of the latent factors with those of other factors known to be associated with severity. Because the current analysis is focused on the examination of the latent factors as a methodological exercise, the full model results are not shown here in order to reduce the complexity of the results, but researchers who are interested in the effects of the other covariates can find the full model results in the online supplemental materials.]. Multiply-imputed data for household income, household education, and child race/ethnicity were available from the NCHS (from the 2009–2010 NS-CSHCN). Using these data with the appropriate methods to incorporate the uncertainty of the imputation process in the estimation of variances resulted in the extent of missing data in the full model dropping from 9% to 2%.

Results

Table 1 describes the demographic characteristics of the population subdivided between the three parent-reported severity levels of mild (n=488), moderate (n=363), and severe (n=116). Children with mild ASD (78.4%) were most likely to have some form of private health insurance while children with moderate ASD (59.6%) or severe ASD (63.0%) were most likely to have some form of public health insurance Children with severe ASD were more likely to be diagnosed with intellectual disability, anxiety problems, and behavioral or conduct problems than children with mild ASD. Children with moderate ASD were more likely to be diagnosed with intellectual disability, depression, and anxiety problems than children with mild ASD. Several child (age, gender, race/ethnicity) and household characteristics (highest education, federal poverty level, number of children, and family structure) did not vary by reported severity.

The measurement model utilized to calculate factor scores, shown in Figure 2, was found to have good fit (CFI = .93, TL = .92, RMSEA = .034). All loadings were significant, as were correlations between symptoms and family impact ($\rho = .43$, $p<.001$), child impact and family impact ($\rho = .50$, $p<.001$) and symptoms and child impact ($\rho = .72$, $p<.001$).

Table 2 presents the multivariate linear regressions where the latent factors of symptoms, child impact, or family impact were the outcomes of interest, which were adjusted by household and child characteristics including the presence of co-occurring psychiatric conditions. Older children were found to have lower symptoms ($\hat{\beta}=-0.05$, 95% CI: −0.08, −0.03, $p<.001$) and child impact factor scores ($\hat{\beta}=-0.04$, 95% CI: −0.07, −0.02, $p<.01$) than younger children. Children diagnosed with behavior or conduct problems or intellectual disability had higher symptoms, child impact, and family impact factor scores than children without these diagnoses (all p's <.01). Children diagnosed with anxiety problems had higher child impact ($\hat{\beta}=0.27$, 95% CI: 0.08, 0.47, $p<.01$) and family impact factor scores ($\hat{\beta}=0.40$, 95% CI: 0.15, 0.64, $p<.01$) than children without anxiety problems, while children diagnosed with depression had higher symptoms ($\hat{\beta}=0.53$, 95% CI: 0.26, 0.79, $p<.001$) and child impact factor scores ($\hat{\beta}=0.48$, 95% CI: 0.23, 0.74, $p<.001$) than children without

depression. Children diagnosed with ADHD had higher symptoms factor scores ($\hat{\beta}$=0.23, 95% CI: 0.03, 0.44, p<.05) than children without ADHD.

Table 3 provides the results of the multinomial logistic regressions where varying levels of parent-reported severity serve as the outcome of interest. In individual models with only one of the three latent variables at a time, children with higher symptoms, child impact, or family impact factor scores were more likely to have moderate ASD than mild ASD. However, only child and family impact factor scores differentiated children with severe ASD from children with moderate ASD. In the combined model, children with higher symptoms (RRR=0.54, 0.34–0.84, p<.01) and family impact factor scores (RRR=0.64, 95% CI: 0.45–0.89, p<.01) were less likely to have mild ASD than moderate ASD, while only children with higher family impact factor scores were more likely to have severe ASD than moderate ASD (RRR=2.71, 95% CI: 1.70–4.32, p<.001).

Discussion

In independent models, symptoms, child impact, and family impact factor scores differentiated children with reported moderate ASD from children with mild ASD, while only family impact factor scores differentiated children with reported severe ASD from those with moderate ASD. In the combined full model, only child symptoms and family impact factor scores were significantly associated with a child being rated as having moderate ASD rather than mild ASD, and only family impact factor scores were significantly associated with a child being rated as having severe ASD rather than moderate ASD. These findings suggest that a parent's conceptualization of a child's ASD severity may vary more as a function of the impact of the child's condition on the family, less as a function of the symptoms exhibited by the child, and very little (if any) as a function of the impact directly felt by the child. Therefore, a parent's perception of his/her child's ASD severity will not be fully captured through a rating scale that relies exclusively on counts or an intensity of autism symptomatology.

The association of family impact with severity ratings is consistent with previous literature. Children with more severe conditions often require substantial efforts by their parents to coordinate care and medical services,[35–36] with some family members having to cut down on work hours or stop working altogether.[37] Families raising a child with ASD with severe or co-occurring impairments are the most likely to struggle financially.[38–40] It is possible that the saliency of financial hardships, and the corresponding ease in which these impacts can be recalled by parents, could play a substantial role in a parent's rating of his/her child's severity, as evidenced by the availability heuristic.[22]

Our results showing that the presence of co-occurring psychiatric conditions was associated with higher factor scores of symptoms, child impact, and family impact is consistent with the current literature.[41–44] Children with co-occurring intellectual disabilities being the least likely to be characterized as having a mild ASD further supports these findings.

The results also suggest the potential for disagreement between clinicians and parents when it comes to the definition of severity and subsequent ratings of severity. Previous research

indicates a parent's conceptualization of severity does not always coincide with objective or clinical assessments for childhood disorders.[45] Our study may explain why this discrepancy exists, with parents focusing more on the impact felt by the family and less on the symptoms displayed by his/her child.

Limitations

There are several limitations that should be taken into account when evaluating the current study. First, the cross-sectional nature of the datasets prevents making causal conclusions about the directionality of associations between the severity rating of the child's ASD and the symptoms, child impact, and family impact of the condition. Second, severity and child and family impact were measured during the NS-CHSCN interview whereas symptoms were measured with the Pathways supplemental questionnaire. Given the time lag between surveys (mean interval = 9 months), it is possible that family circumstances or ASD symptomatology may have changed between interviews. Third, it is important to note that estimates based on telephone surveys with low response rates (16% for general survey; 11% for supplemental questionnaire) may be unreliable due to selection biases resulting from sampling, nonresponse, lack of coverage of households without telephones, and respondent classification and reporting errors. The impact of these potential biases on the results presented in the study is unknowable. Sample weights were adjusted to account for known demographic correlates of nonresponse and were calculated in accordance with best practices for sample surveys. A sensitivity analysis of NS-CSHCN data (not shown) revealed socio-demographic characteristics and ASD severity did not differ significantly between households of children with ASD whose parents did or did not complete the Pathways survey (see the Pathways FAQs[24] for more information on sampling weights). However, the representativeness of the estimates cannot be confirmed because biases may remain that are not related to known demographics. However, the low response rate and potential for non-response bias are perhaps less of a concern for the present study given the focus of the analysis is on the association between factors rather than on generating population estimates. Despite these limitations, notable strengths include the large national probability-based sample of children with ASD (although institutionalized children are not represented) and the full array of information collected in the initial 2009–2010 NS-CSHCN and the follow-up Pathways survey.

Conclusions

Clinicians rely in part on a parent's evaluation of their own child's symptoms when performing a clinical assessment[46] given the parent's familiarity with the child's day to day functioning. Yet, parents may place more emphasis on family impact instead of ASD symptomatology when evaluating symptom severity differing from guidelines established for clinicians in rating the severity of a child's ASD.[2] Therefore, to the extent that clinicians are dependent on parents to bring children with ASD for appropriate assessments and treatments (as is frequently seen in rural settings);[7] and to the extent that parents' motivation to do so is based on their perceptions of the child's condition, children with the greatest level of symptomatology and impairment may not necessarily be the most frequently seen by clinicians.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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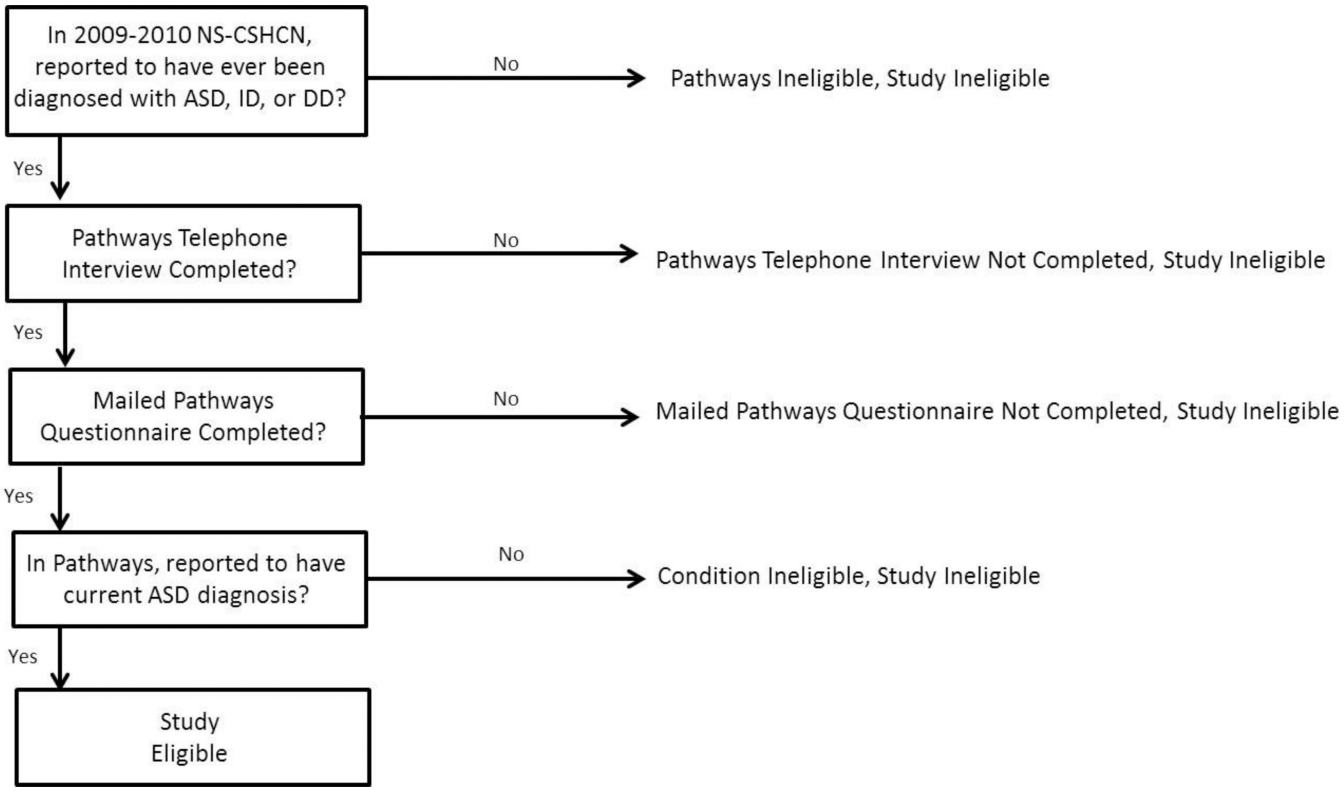

Figure 1. Flow chart detailing steps in identifying analytic sample

Description: A flow chart designed to help readers understand eligibility factors for sample inclusion in the current study.

Note: NS-CSHCN is the National Survey of Children with Special Health Care Needs; ASD is autism spectrum disorder, ID is intellectual disability, DD is developmental delay

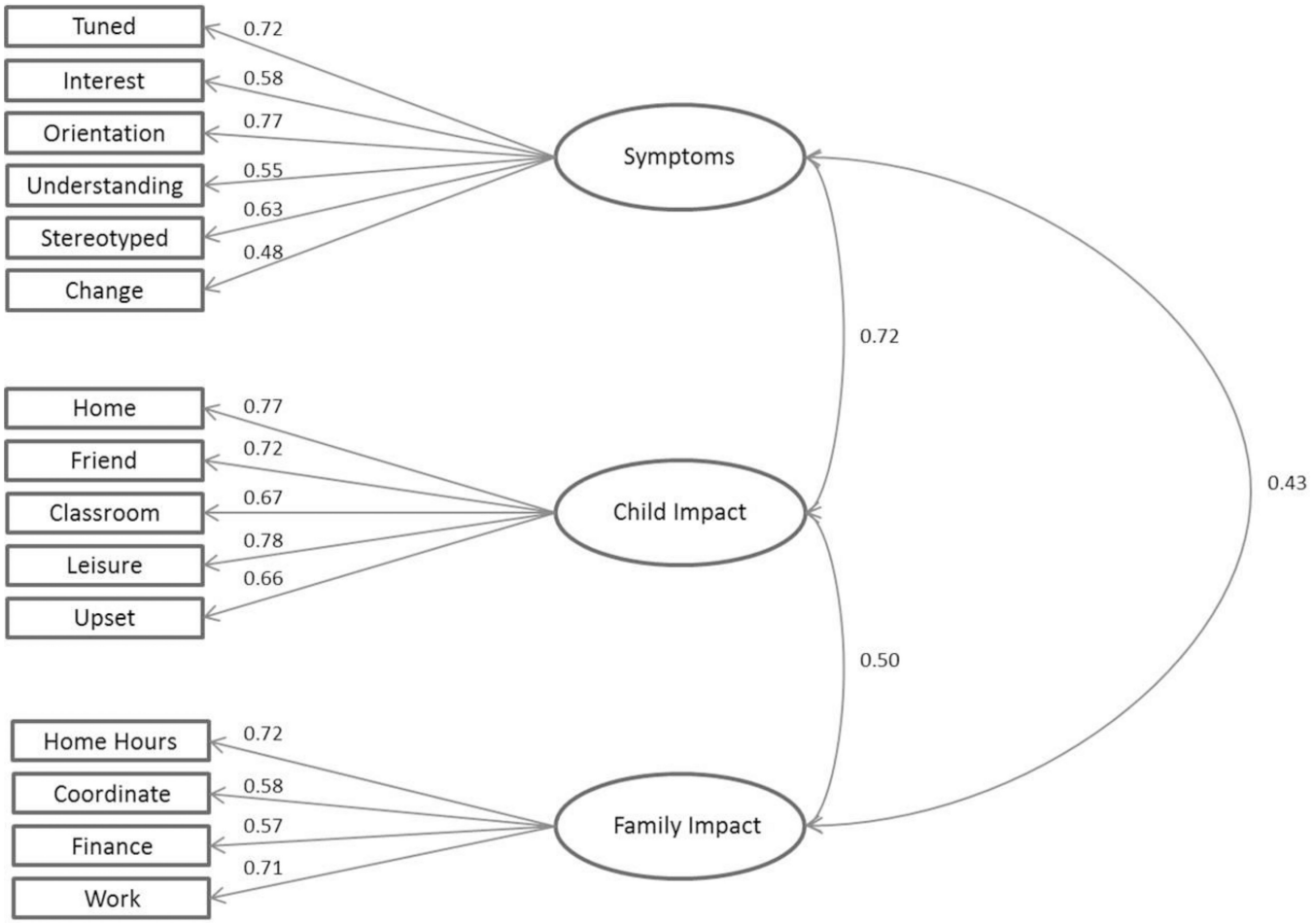

Figure 2. Results from the measurement model for symptoms, child impact, and family impact

Description: The measurement model generated to understand the relationship between factors and the loadings of individual questions on the factors themselves.

Note: All values are standardized coefficients which can be interpreted as correlations. All pathways are significant at the <.001 level.

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Table 1

Population demographic characteristics by parent-rated ASD severity

	Total (n=967)	Mild (A) (n=488)	Moderate (B) (n=363)	Severe (C) (n=116)	F-value	Significant Comparisons
Child Characteristics						
Age (%)						
6–11 Years	54.3	59.9	45.7	57.4	2.96	
12–17 Years	45.7	40.1	54.3	42.6		
Sex (%)						
Male	84.4	84.6	84.2	83.9	0.01	
Race/Ethnicity (%)						
Non-Hispanic White	70.0	71.9	68.2	68.3	1.39	
Non-Hispanic Black	8.1	7.1†	6.5†	15.5†		
Non-Hispanic Other	11.0	8.4	16.2	6.8†		
Hispanic	10.9	12.6	9.1	9.4†		
Health Insurance Type (%)						
Private/Employment-Based	69.3	78.4	59.6	63.0	3.24[a]	A>B; A>C
Public	28.7	20.2	37.3	36.0		B>A; C>A
Uninsured	2.0†	1.4†	3.1†	*		
Current Psychiatric Condition (%)						
ADHD	47.8	41.6	54.7	51.5	2.42	
Anxiety	40.3	33.1	46.0	50.8	3.57[a]	C>A; B>A
Depression	14.9	10.2	21.2	14.6	3.10[a]	B>A
Behavioral/Conduct	27.3	21.0	28.8	45.8	5.07[b]	C>A; C>B
Intellectual Disability	22.2	10.3	29.7	45.5	14.41[c]	C>A; B>A
Family Characteristics						
Highest Household Education (%)						
High School or Less	20.0	18.1	21.7	22.8†	0.33	
Some College or More	80.0	81.9	78.3	77.2		
Federal Poverty Level (%)						

	Total (n=967)	Mild (A) (n=488)	Moderate (B) (n=363)	Severe (C) (n=116)	F-value	Significant Comparisons
< 100%	16.4	16.4	15.5	19.0	1.28	
100 – <200%	16.8	12.7	19.8	23.4†		
200 – <400%	36.5	35.1	39.6	33.5		
≥ 400%	30.3	35.8	25.1	24.1		
Number of Children in Household (%)						
1	25.3	23.4	25.7	30.8	0.63	
2 or More	74.7	76.6	74.3	69.2		
Family Structure (%)						
Two Parents (biological/adoptive/step)	69.8	74.0	66.2	64.3	1.12	
Other (e.g., single parent)	30.2	26.0	33.8	35.7		

Note: ASD = Autism spectrum disorder; ADHD = Attention deficit hyperactivity disorder

[a] .01≤*p*<.05

[b] 001≤*p*<.01

[c] *p*<.001

† Estimates have a relative standard error above 30% and less than or equal to 50% and may therefore be unreliable

* Estimate has a relative standard error above 50% and due to insufficient reliability is not reported

Table 2

Results from multivariate linear regression models of symptoms, child impact, and family impact on child and family characteristics

	Symptoms $\hat{\beta}$ (95% CI)	Child Impact $\hat{\beta}$ (95% CI)	Family Impact $\hat{\beta}$ (95% CI)
Child Characteristics			
Age	−0.05[c] (−0.08, −0.03)	−0.04[b] (−0.07, −0.02)	−0.02 (−0.06, 0.01)
Male	−0.10 (−0.32, 0.13)	−0.06 (−0.26, 0.15)	0.04 (−0.19, 0.28)
Race/Ethnicity			
Non-Hispanic White	Reference	Reference	Reference
Non-Hispanic Black	−0.16 (−0.54, 0.21)	−0.18 (−0.58, 0.23)	0.04 (−0.37, 0.46)
Non-Hispanic Other	0.05 (−0.29, 0.39)	−0.20 (−0.54, 0.14)	−0.24 (−0.56, 0.09)
Hispanic	0.19 (−0.15, 0.54)	0.13 (−0.21, 0.47)	0.09 (−0.27, 0.45)
Health Insurance Type			
Private/Employment-Based	−0.22 (−0.77, 0.34)	−0.27 (−0.69, 0.14)	−0.16 (−0.73, 0.41)
Public	−0.06 (−0.63, 0.52)	−0.11 (−0.57, 0.35)	0.07 (−0.52, 0.67)
Uninsured	Reference	Reference	Reference
Current Psychiatric Condition			
ADHD	0.23[a] (0.03, 0.44)	0.20 (0.00, 0.39)	0.07 (−0.16, 0.30)
Anxiety Problems	0.17 (−0.03, 0.36)	0.27[b] (0.08, 0.47)	0.40[b] (0.15, 0.64)
Depression	0.53[c] (0.27, 0.79)	0.48[c] (0.23, 0.74)	0.08 (−0.21, 0.37)
Behavioral or Conduct Problems	0.50[c] (0.27, 0.72)	0.50[c] (0.27, 0.74)	0.44[b] (0.24,0.74)
Intellectual Disability	0.39[b] (0.17, 0.61)	0.39[b] (0.17, 0.61)	0.49[b] (0.18, 0.69)
Household Characteristics			
Federal Poverty Level			
< 100%	Reference	Reference	Reference
100 – <200%	0.16 (−0.20, 0.53)	0.25 (−0.14, 0.65)	0.08 (−0.33, 0.48)
200 – <400%	0.07 (−0.30, 0.44)	0.24 (−0.14, 0.63)	0.04 (−0.32, 0.40)
≥ 400%	−0.19 (−0.55, 0.18)	0.11 (−0.27, 0.49)	−0.30 (−0.67, 0.07)
Highest Household Education			
Less than High School	Reference	Reference	Reference
High School Graduate	−0.16 (−0.80, 0.49)	−0.50 (−1.33, 0.32)	−0.08 (−0.65, 0.49)
More than High School	−0.27 (−0.82, 0.28)	−0.25 (−0.99, 0.48)	0.13 (−0.37, 0.63)
Two or More Children Household	0.10 (−0.12, 0.33)	0.14 (−0.10, 0.38)	−0.05 (−0.29, 0.18)
Two Parent Household	0.12 (−0.14, 0.39)	0.07 (−0.20, 0.34)	0.15 (−0.11, 0.41)

Note: ADHD = Attention deficit hyperactivity disorder; CI = Confidence Interval

[a] $.01 \leq p < .05$

[b] $001 \leq p < .01$

[c] $p < .001$

Table 3

Multinomial logistic regression results for autism severity

Dependent variable	Symptoms RRR (95% CI)	Child Impact RRR (95% CI)	Family Impact RRR (95% CI)	Combined RRR (95% CI)
Mild Severity				
Symptoms	0.46[c]	---	---	0.54[b]
	(0.34–0.61)	---	---	(0.34–0.84)
Child Impact	---	0.51[c]	---	1.08
	---	(0.38–0.68)	---	(0.69–1.66)
Family Impact	---	---	0.50[c]	0.64[b]
	---	---	(0.38–0.67)	(0.45–0.89)
Moderate Severity (Reference)	1.00	1.00	1.00	1.00
Severe Severity				
Symptoms	1.46	---	---	0.98
	(0.99–2.16)	---	---	(0.48–2.03)
Child Impact	---	1.62[a]	---	0.97
	---	(1.04–2.54)	---	(0.45–2.10)
Family Impact	---	---	2.60[c]	2.71[c]
	---	---	(1.71–3.97)	(1.70–4.32)

Note: RRR = Relative risk ratio; CI = Confidence Interval

All models adjusted for child and family characteristics listed in Table 1. A table displaying results for all included covariates is available online as supplement material.

[a] $.01 \leq p < .05$

[b] $001 \leq p < .01$

[c] $p < .001$